Homework6 zl9901

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a $P(A=1\mid+)=\frac{3}{5}$ $P(A=0\mid+)=\frac{2}{5}$

$P(B=1\mid+)=\frac{1}{5}$ $P(B=0\mid+)=\frac{4}{5}$

$P(C=1\mid+)=\frac{4}{5}$ $P(C=0\mid+)=\frac{1}{5}$

$P(A=1\mid-)=\frac{2}{5}$ $P(A=0\mid-)=\frac{3}{5}$

$P(B=1\mid-)=\frac{2}{5}$ $P(B=0\mid-)=\frac{3}{5}$

$P(C=1\mid-)=\frac{5}{5}$ $P(C=0\mid-)=\frac{0}{5}$

b $P(+)=0.5$ $P(-)=0.5$

$P(+|A,B,C)\propto P(A=0,B=1,C=0|+)P(+)=$
$P(A=0|+)P(B=1|+)P(C=0|+)P(+)=0.008$

$P(-|A,B,C)\propto P(A=0,B=1,C=0|-)P(-)=$
$P(A=0|-)P(B=1|-)P(C=0|-)P(-)=0$

Since P(+|A,B,C)>P(-|A,B,C), the final prediction should be –

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First iteration, the center of first cluster is O1(1,1)
The center of second cluster is O2(2,1)

$$distCO1=\sqrt{(4-1)^2+(3-1)^2}=3.6$$

$$distCO2=\sqrt{(4-2)^2+(3-1)^2}=2.8284$$

Point C should belong to second Cluster.

$$distDO1=\sqrt{(5-1)^2+(4-1)^2}=5$$

$$distDO2=\sqrt{(5-2)^2+(4-1)^2}=4.24264$$

Point D should belong to second cluster.
First cluster: {A}
Second cluster: {B,C,D}

Second iteration, the center of first cluster is O1(1,1)

The center of second cluster is $\left(\frac{2+4+5}{3}, \frac{1+3+4}{3}\right) = (3.66, 2.66)$

$$distAO1 = \sqrt{(1-1)^2 + (1-1)^2} = 0$$

$$distAO2 = \sqrt{(1-3.66)^2 + (1-2.66)^2} = 3.1355$$

Point A should belong to first Cluster.

$$distBO1 = \sqrt{(2-1)^2 + (1-1)^2} = 1$$

$$distBO2 = \sqrt{(2-3.66)^2 + (1-2.66)^2} = 2.3476$$

Point B should belong to first cluster.

$$distCO1 = \sqrt{(4-1)^2 + (3-1)^2} = 3.6$$

$$distCO2 = \sqrt{(4-3.66)^2 + (3-2.66)^2} = 0.48$$

Point C should belong to second Cluster.

$$distDO1 = \sqrt{(5-1)^2 + (4-1)^2} = 5$$

$$distDO2 = \sqrt{(5-3.66)^2 + (4-2.66)^2} = 1.895$$

Point D should belong to second cluster.
First cluster: {A,B}
Second cluster: {C,D}

Third iteration, the center of first cluster is $\left(\frac{1+2}{2}, \frac{1+1}{2}\right) = (1.5, 1)$

The center of second cluster is $\left(\frac{4+5}{2}, \frac{3+4}{2}\right) = (4.5, 3.5)$

$$distAO1 = \sqrt{(1-1.5)^2 + (1-1)^2} = 0.5$$

$$distAO2 = \sqrt{(1-4.5)^2 + (1-3.5)^2} = 4.3$$

Point A should belong to first Cluster.

$$distBO1 = \sqrt{(2-1.5)^2 + (1-1)^2} = 0.5$$

$$distBO2 = \sqrt{(2-4.5)^2 + (1-3.5)^2} = 3.5355$$

Point B should belong to first cluster.

$$distCO1 = \sqrt{(4 - 1.5)^2 + (3 - 1)^2} = 3.2$$

$$distCO2 = \sqrt{(4 - 4.5)^2 + (3 - 3.5)^2} = 0.7$$

Point C should belong to second Cluster.

$$distDO1 = \sqrt{(5 - 1.5)^2 + (4 - 1)^2} = 4.6$$

$$distDO2 = \sqrt{(5 - 4.5)^2 + (4 - 3.5)^2} = 0.7$$

Point D should belong to second Cluster.
Finally the result converges,
First cluster: {A,B}
Second cluster: {C,D}